

Interaction and Interpersonality in Online Discussion Forums

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This longitudinal study evaluated the amount and type of interaction and interpersonal content in messages posted by online graduate students in small group asynchronous forums. It also assessed the relationship between interpersonality and interactivity. To achieve this, a new coding scheme was developed to categorize the content of online forums. The results suggest that cultivating interpersonality online leads to increased participation and expands the depth of discussion, thus facilitating online collective knowledge building. Finally, regulating the complexity of interactions and fostering the development of a cohesive group of participants through increased interpersonal exchanges may render more controlled patterns of interactive online behavior and improve collective learning.

Introduction

Since the early days of online learning, educators and researchers have speculated that computer-mediated communication (CMC) is qualitatively different from communication in the face-to-face classroom. It has been argued that CMC facilitates critical thinking, collaboration, and knowledge building (Harasim, 1989). Although there has been a considerable amount of research into the nature of interaction in online discussion forums, most of it has examined single courses that extend over relatively short time periods of less than 1 year (Bullen, 1998). Few studies have examined online communication or group processes over a time period longer than 1 year. Furthermore, researchers have begun only recently to look into the social dimensions of online communication and their impact on the quality of interaction. Course designers and online instructors need to understand how students interact and how groups develop in computer-mediated environments.

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Research into the nature of communication in online courses, focusing specifically on the building and maintenance of relationships and group dynamics over time periods longer than a single course, may have important implications for educational practices.

Dimensions of Online Communication

This study investigated the suggestion that the educational quality of the online learning environment may be affected by the social relationships that learners develop online. To do this the relationship between interpersonal and interactivity in online academic discussion forums was examined.

Interpersonality and Impersonality

Interpersonality is social or personally oriented interaction or informal communication aimed at the creation of relationships among participants (Sudweeks & Simoff, 1999). Impersonality is task-oriented communication in which information is offered or requested (Walther, 1996).

The concept of social presence is closely related to interpersonal. Social presence refers to “the ability of participants in a community of inquiry to project themselves socially and emotionally, as ‘real’ people (i.e., their full personality), through the medium of communication being used” (Garrison, Anderson, & Archer, 2000, p. 94). The greater the number of cue systems that users have in communication, the more social presence they will experience which should lead to interpersonal warmth, friendliness, and satisfaction with the interaction. It has been argued that face-to-face interaction has the potential for much greater social presence than text-based communication but research on text-based online communication has shown that it does permit high levels of interpersonal communication and thus social presence (Rourke, Anderson, Garrison, & Archer, 2001).

A number of studies have looked specifically at the issue of social presence in CMC and have tended to contradict the claim that the medium is not conducive to the development of interpersonal (Kanuka & Anderson, 1998; Rourke et al., 2001; Stacey, 1999, 2002; Swan, 2003). Some have even suggested that text-based CMC interaction can foster higher levels of interpersonal than face-to-face communication (Walther, 1996; Rourke, Anderson, Garrison, & Archer, 2003). Most agree with Garrison and Anderson’s (2003) contention that social presence is a necessary pre-condition for cognitive presence (Stacey, 1999).

Dimensions of Interpersonality and Impersonality

In this study, a 12-category taxonomy for evaluating online interpersonal content was used. This was based on the work of Bales (Bales, 1950, in D’Andrade & Wish, 1985), Bales and Cohen (1979), Lundgren (1977), Schutz (1994), Henri (1992a), Rafaeli and Sudweeks (1993), Walther and Burgoon (1992), Higgins (1998), and

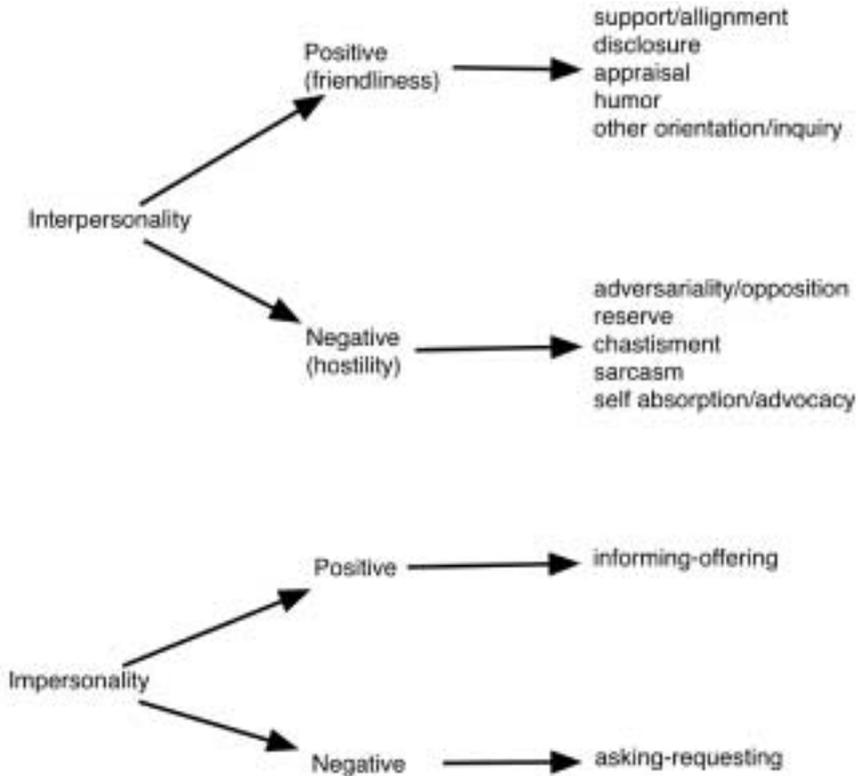


Figure 1. Dimensions for analysing interpersonality in CMC (Beuchot, 2001)

Mabry (1997). Interpersonality was also categorized by valence (positive or negative). Figure 1 illustrates the taxonomy used in the study.

Interaction

The potential for interaction is the most salient and most influential characteristic of computer conferencing; it alters the nature of learning and increases its quality (Harasim, 1989; Henri, 1992b; Anderson, 2003). In this study, interaction was categorized as active, reactive, or interactive. Interaction is *active* when it does not refer to other messages. Interaction is *reactive* when it refers implicitly or explicitly to a message posted immediately before the reactive message. What distinguishes *interactive* interaction from active or reactive interaction is “the extent to which messages in a sequence relate to each other, and especially the extent to which later messages recount the relatedness of earlier messages” (Rafaeli & Sudweeks, 1998, p. 175). Interactivity thus requires a thread of messages, or a chain of interrelated messages, while reactivity can be assimilated to one-way feedback. Thus, interactivity expresses the degree to which “interaction transcends mere reaction” (Berthold, Sudweeks, Newton, & Coyne, 1998, p. 191). Interaction in its three dimensions (active, reactive,

interactive), together with interpersonal, is a pivotal measure of the social dynamics of group communication.

Whether a given property of CMC, a by-product of instructional design, or a property of messages that reflect back on themselves, feed on and respond to the past, interactivity is associated with the attitudinal dimensions of acceptance and satisfaction, motivation, sense of fun, openness, frankness, and sociability (Rafaeli & Sudweeks, 1998). In other words, it is strongly associated with interpersonal dimensions of messages. Therefore, interactivity is not an intrinsic trait of conference forums, and it is not a series of unrelated postings, but a collaborative effort of all the participants (Ahern, 1994).

Despite the numerous studies that have examined the concept of interaction, there is still no consistent understanding of the concept. Interactivity is for some authors (Henri, 1992a; McDonald, 1997) what reactivity is for others (Rafaeli, 1988; Rafaeli & Sudweeks, 1998), while some of them (Henri, 1992a) consider speech segments as interactive and others support interactivity as describing the whole message (Rafaeli & Sudweeks, 1998).

Figure 2 illustrates the dimensions of interaction examined in this study.

Hypotheses

This study attempted to test the following hypotheses:

- H₁: Initial levels of active content will tend to decrease (0.05 level) during the online interaction.
- H₂: Initial levels of reactive content will tend to increase (0.05 level) through time for each online forum.
- H₃: Overall interactive content in graduate students online forums will increase (0.05 level), from initial levels, over the duration of the study.
- H₄: Initial levels of negative interpersonal content and initial levels of positive interpersonal content will vary significantly (0.05 level) through time.
- H₅: Initial levels of positive impersonal content and initial levels of positive interpersonal content will vary significantly (0.05 level) through time.
- H₆: Initial levels of overall interpersonal content and initial levels of overall impersonal content will vary significantly (0.05 level) through time.
- H₇: Overall interpersonal content will be positively related (0.05 level) to the amount of reactive and interactive content in graduate students' online messages, across the set of forums analyzed.
- H₈: Overall impersonal content will be positively related (0.05 level) to active content in graduate students' online messages, across the set of forums analyzed.

This study identified the types of interpersonal and impersonal communications in the online discussions and assessed the quality of interaction as the group evolved over time in order to determine whether there was a relationship between interpersonal/impersonality and interaction. As the literature has established the relevance of improved socio-emotional relations and interactivity as a condition for critical thinking and knowledge building, this study focused on the nature of the relationship between both constructs.

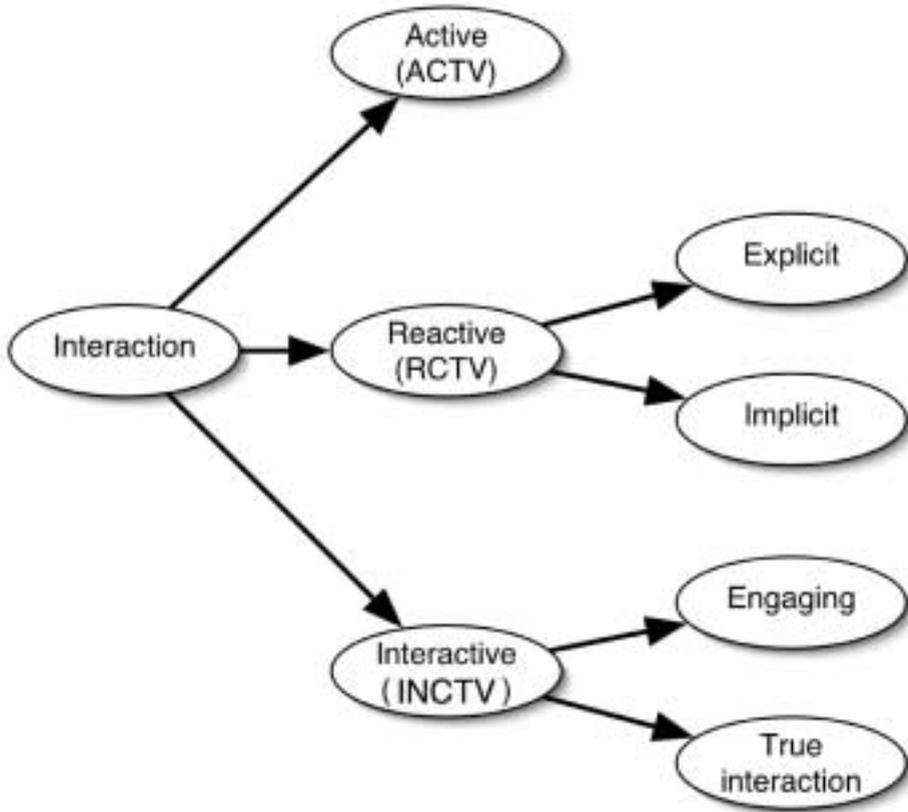


Figure 2. Dimensions for analysing interactions in CMC (Beuchot, 2001)

Method

Data were obtained from the messages posted to conference forums by 16 participants in the doctoral program in Education at the Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM) in Mexico. The participants were selected through convenience sampling, for three reasons. First, the doctoral program in Education at ITESM was relatively new and this was the first group of students in the program. Second, the group was kept almost intact during the online interactions throughout the first three semesters, using the same technology throughout that time, keeping its natural academic boundaries and establishing recurrent online interactions. Third, the group was homogeneous in several respects. All of the students were required to have a Master's degree in Education and a score of over 550 on the TOEFL for admission to the program. All except one of the students has Spanish as mother tongue, and all of them lived in Mexico. Their previous consent was obtained through a personal subject release form. All of them agreed to share their online collaborations with the researcher, the independent coder, and the educational institutions if granted privacy, confidentiality, and protection through

Table 1. Relationship among sampling levels

Semester No. (Course code)	Discussion groups (month/year)	Threads	Messages	Sentences
		Context independent	Context	Dependent
1 (Des&Dev)	1 ^a (September 97)	14	29	357
	2	16	22	286
	3	21	83	1,079
	4	17	39	507
	(5) Not considered for this study (international group)			
Sub-total	4	68	173	2,229
2 (Sel&Use)	6	6	75	975
	7	10	61	793
	(8) Not considered for this study (non-graded participation)			
	9 ^b (March 98)	7	56	792
	(10) Not considered for this study (non-graded participation)			
	11	9	55	515
Sub-total	4	32	247	3,275
3 (Plan&Man)	12	19	93	1,209
	13	19	107	1,391
	14 ^c (October 98)	17	75	947
Sub-total	3	55	275	3,367
Grand total	11	155	695	8,871

^{a,b,c} (sampled forums).

coded identity. As Table 1 indicates, five levels of entities were sampled: semesters/courses (participants took three semesters/courses), online group discussions (11), message threads, messages, and individual sentences.

Data Collection Methods and Procedures

A combination of qualitative and quantitative data and methods were used in this study. The qualitative data and methods involved the analysis of the content of the discussion forums. The quantitative dimension involved counting and categorizing the units of content analysis which took the form of numeric values assigned to explanatory and response variables.

Analyzing conference discussions allows us to examine the social and cognitive processes at work in online natural environments that do not permit manipulation of variables, which is an issue that increases external validity in the analysis of computer communication data. Conference transcript analysis also allows for

unobtrusive, immediate access to real data, simplifying the data collection process.

In this study, a form of content analysis was used that is similar to discourse analysis. According to Stubbs (1983), discourse analysis consists of “attempts to study the organisation of language above the sentence or above the clause, and therefore to study larger linguistic units, such as conversational exchanges or written texts” (p. 1). Discourse analysis, as opposed to content analysis, is focused on language in use in particular interactions (Schiffrin, 1996). It is concerned more with the function of language than with the form. In this study, the emphasis was placed upon the qualitative aspect of the former, providing data for both independent (interactivity) and dependent (interpersonal content) variables.

Unit of Measurement

For this study, the sentence as a grammatical unit was used as a unit of measurement to assess the type of interaction and the level of interpersonality in online messages, as it is efficient and empirically significant; it represents a middle unit of content/discourse analysis (not too detailed or too vague); and it presents a higher degree of reliability for coding purposes than speech segments. The sentence approach is reasonable as online conversation may be viewed as having a written expression and presented in sentence format. A sentence was considered as “a section of the message that contains one item of information and that is comprehensible even if read outside the context in which it is embedded” (Gall, Borg, & Gall, 1996, p. 563; Rourke et al., 2003).

Coding Scheme

The essence of content analysis is the coding of messages into categories. In the following coding scheme, the two variables are not exclusive. Thus, a sentence was coded twice, once for interaction and a second time for interpersonality/impersonality. However, categories within each variable (five discrete categories for interactivity and six bipolar categories for interpersonality/impersonality) are *mutually exclusive* and *collectively exhaustive*.

Figures 1 and 2 illustrate the categories of analysis for the two main variables in the study. Table 2 presents the identification codes for each category.

Definition, Explanation, and Indicators of Categories

Both the coding model and the operationalization and explanation of coding categories for interpersonality/impersonality and interaction are based on theoretical issues, coding frameworks, and specific coding explanations for analyzing CMC in the literature. See the Appendix for a more detailed explanation of the categories.

Table 2. Identification codes for interpersonality and interaction categories

Categories	Identification code
Interpersonality	
Support-alignment/adversariality-opposition	(SPRT/OPPTN)
Disclosure/reserve	(DSRE/RSVE)
Appraisal/chastisement	(APRL/CHMT)
Humor/sarcasm	(HMR/SRSM)
Inquiry/advocacy	(INQR/ADVC)
Inform-offer/ask-request (impersonality)	(INFM/RQST)
Other	(OTHR)
Interaction	
Active	(ACTV)
Explicit reactive	(EXRTV)
Implicit reactive	(IMRTV)
Engaging interactive	(EGINTV)
Interactive	(INCTV)

The Coding Process

The first step in the coding process was to conduct a pilot study. The three main purposes of the pilot study were to try out the coding scheme, to set the stage for inter-coder reliability and to further refine the established hypotheses. The pilot study worked with the same data as the real study. Reliability among coders was then assessed to determine whether the pilot study could be used as the definitive study.

Before the coding process was carried out, the messages on each sample group selected for the study were taken individually to identify the sentences to be coded. They were assigned a classification code (sentence number/message number/forum number). Message number refers to the ordinal position of the message in a message hierarchy. So each message now had a code that looked like this: 17/4/9. Then, the messages in each forum were read once as an entire conversation to grasp the general meaning and tone of the online exchange, and assess, intuitively, the overall level of interpersonality and interaction. Once this was done, each message was read a second time and coded for interaction categories for each sentence. A third reading was performed to code for interpersonality categories. Coders could now identify each sentence by a classification code and a pair of identification codes (17/4/9; ACTV/DSRE).

For this study, two independent coders were hired. Preliminary training was furnished for the coders during two 4-hour sessions on 2 consecutive days, explaining the meaning and relevance of the study, the operational definitions of the variables, and examining examples for each crossing of categories for each variable.

Additionally, a 4-week practice was undertaken on non-sampled transcripts used to extract the coding examples. Information they submitted further refined the

coding categories. The two independent coders, as well as the first author, coded identical messages. The three coders were familiar with the category definitions and the coding procedure, as well as with the problems the researcher faced when pilot coding. Each message was analyzed sentence by sentence, coding each of them twice: once to determine the type of interpersonality, and a second time to assess the type of interaction. Thus, each sentence had two codes in the data entry form.

Reliability and Validity

The three coders coded identical messages (all sentences in Forum 1, which account for 17% of the total number of sentences for the study). As stated above, some research studies report percentage of agreement. However, some agreement will occur by chance, which should artificially inflate the amount of *real* agreement in a percentage of simple agreement. Kappa techniques are ways to correct for agreement by chance (Cohen, 1960).

For this study, an overall kappa value for each variable and individual kappa values for each independent category were calculated. The latter revealed those categories in which raters had trouble agreeing, thus indicating either a need to refine the operational definitions for those categories, a deficiency in coder training, or a combination of both. Regarding kappa values, this study follows the stricter and more recent kappa ranges specified by Li and Lautenschlager (1997) and Capozzoli, McSweeney, and Sinha (1999):

- 0.40–0.59: borderline;
- 0.60–0.75: good;
- 0.75 and higher: excellent.

For practical or clinical uses, an index value smaller than 0.40 is unacceptable.

Overall, for both variables, five categories (28%) were rated as excellent, comprising only 35 sentences (5% of the total number of sentences in both categories for Coder 1); six categories (33%) were rated as good, comprising 587 sentences (82% of the total number of sentences in both categories for Coder 1); and seven categories (39%), with only 92 sentences (13% of the total number of sentences in both categories for Coder 1), were rated either as borderline/fair or unacceptable/poor. This is reflected in the overall kappa for interpersonality (0.64) and for interaction (0.65), both considered as good (see Tables 3 and 4). Due to these results, and after a random selection, Coder 1 observed frequencies were considered for this study.

Content, construct, and criterion validity are the most commonly used types of evidence to assess the validity of an instrument in classical procedures. The absence of a panel of experts and of a gold standard with which to compare the results (McDonald, 1997), together with the principle of content analysis which states that coding categories must be exhaustive and mutually exclusive, imply that a clear operational definition of variables, based upon coding schemes and established methods and theories taken from the literature, sufficiently account for both content and construct validity.

Table 3. Specific inter-coder reliability for Forum 1 (interpersonality) with coding values

Category	Coders			Total (No./%)	<i>K</i> (kappa)	Rating
	Coder 1 ^a	Coder 2	Coder 3			
SPRT	27	31	25	83 (7.75)	0.81	Excellent
DSRE	42	64	51	157 (14.65)	0.53	Fair
APRL	3	3	2	8 (0.74)	0.59	Fair
HMR	8	4	2	14 (1.30)	0.34	Poor
INQR	6	5	4	15 (1.40)	0.79	Excellent
INFM	105	94	109	308 (28.75)	0.65	Good
OPPTN	2	4	3	9 (0.84)	0.76	Excellent
RSVE	0	0	0	0 (0.00)	1.00	Excellent
CHMT	0	0	0	0 (0.00)	1.00	Excellent
SRSM	8	10	12	30 (2.80)	0.51	Fair
ADVC	148	134	139	421 (39.30)	0.69	Good
RQST	1	3	0	4 (0.37)	0.29	Poor
OTHR	7	5	10	22 (2.05)	0.63	Good
Total	357	357	357			
Overall kappa					0.64	Good

^aFrequency lists under each coder refer to the number of sentences labeled for each category.

Results

Hypotheses H_1 , H_2 , and H_3 were accepted, based on the results presented in Table 5.

According to data in Sub-Table 1, at least one forum was found to be significantly different from the others, $\chi^2(4, N = 2,096) = 20.88, p < 0.005$. Each independent interaction category difference is reported as follows: in contingency Sub-Table 2, active content showed a significant difference from composite reactive and interactive

Table 4. Specific inter-coder reliability for Forum 1 (interactivity) with coding values

Category	Coders			Total (No./%)	<i>K</i> (kappa)	Rating
	Coder 1 ^a	Coder 2	Coder 3			
ACTV	263	274	280	817 (76.28)	0.72	Good
EXRTV	61	52	57	170 (15.87)	0.67	Good
IMRTV	19	22	12	53 (4.94)	0.29	Poor
EGINTV	11	8	7	26 (2.42)	0.56	Fair
INCTV	3	1	1	5 (0.46)	0.62	Good
Total	357	357	357			
Overall kappa					0.65	Good

^aFrequency lists under each coder refer to the number of sentences labeled for each category.

Table 5. Frequency of sentences for interaction categories and their analyses for forums tested

Sub-Table	Category	Forum 1 (8 days)	Forum 9 (12 days)	Forum 14 (22 days)	χ^2 Homogeneity	χ^2 Trend ^a
1	ACTV	263 (73.7%)	537 (67.8%)	580 (61.2%)	20.88*	
	RCTV	80 (22.4%)	223 (28.2%)	311 (32.8%)		
	INCTV	14 (3.9%)	32 (4.1%)	56 (5.9%)		
2 (H ₁) ^b	ACTV	263 (73.7%)	537 (67.8%)	580 (61.2%)	19.97*	19.95* ↘
	RCTV + INCTV	94 (26.3%)	255 (32.2%)	367 (38.8%)	<i>N</i> = 2,096 <i>df</i> = 2	
	3 (H ₂)	RCTV	80 (22.4%)	223 (28.2%)	311 (32.8%)	
	ACTV + INCTV	277 (77.6%)	569 (71.8%)	636 (67.2%)	<i>N</i> = 2,096 <i>df</i> = 2	
4 (H ₃)	INCTV	14 (3.9%)	32 (4.1%)	56 (5.9%)	4.08	3.35 ↗
	ACTV + RCTV	343 (96.1%)	760 (95.9%)	891 (94.1%)	<i>N</i> = 2,096 <i>df</i> = 2	

^aTrend refers to long-term increase or decrease in the magnitude of a variable. Variables that increase or decrease randomly and non-significantly fit the definition of trendless (Monge, 1995). All trend Sub-Tables from 2 to 4 have a *df* = 1.

^bH₁, H₂, and H₃ refer to the hypotheses.

**p* < 0.005.

content in the three forums, $\chi^2(2, N = 2,096) = 19.97, p < 0.005$, as well as reactive content when compared to the composite of active and interactive content in the contingency Sub-Table 3, $\chi^2(2, N = 2,096) = 14.42, p < 0.005$. However, interactivity is not significantly present, $\chi^2(2, N = 2,096) = 4.10$, for data in the contingency Sub-Table 4. Interactivity is homogeneously distributed over time. Trend analysis reveals significant descending tendencies for active content, while disclosing significant ascending tendencies for reactive content over time. Interactive content increase through time was found to be not significant.

Hypotheses H₄ and H₅ were rejected, while hypothesis H₆ was accepted, based on the results presented in Table 6.

According to the contingency Sub-Table 1, at least one forum was found to be significantly different from the others over time, $\chi^2(8, N = 2,096) = 17.67, p < 0.025$. For H₄, the calculations for chi-square for homogeneity in Sub-Table 8 indicate that there is no significant difference in the proportions of positive and negative interpersonality across the three forums, $\chi^2(2, N = 1,331) = 4.14$. This means that both categories are homogeneous. The initial differences in proportions do not vary significantly over time.

Table 6. Frequency of sentences for interpersonality categories and their analyses for forums tested

Sub-Table	Category	Forum 1 (8 days)	Forum 9 (12 days)	Forum 14 (22 days)	χ^2 Homogeneity	χ^2 Trend ^a
1	INTPRL (+)	86 (24.1%)	179 (22.2%)	210 (22.7%)	17.67* N = 2,096 df = 8	
	INTPRL (-)	158 (44.3%)	277 (34.9%)	421 (44.4%)		
	IMPRL (+)	105 (29.4%)	295 (37.2%)	296 (31.3%)		
	IMPRL (-)	1 (0.3%)	28 (3.5%)	6 (0.6%)		
	OTHR	7 (1.9%)	13 (1.6%)	14 (1.5%)		
2	INTPRL (+/-)	244 (68.3%)	456 (57.6%)	631 (66.6%)	20.63*** N = 2,096 df = 4	
	IMPRL (+/-) ^a	106 (29.7%)	323 (40.7%)	302 (31.9%)		
	OTHR	7 (1.9%)	13 (1.6%)	14 (1.5%)		
3	INTPRL (+)	86 (24.1%)	179 (22.2%)	210 (22.7%)	0.54 N = 2,096 df = 2	0.47
	INTPRL (-)/ IMPRL (+/-)/ OTHR	271 (75.9%)	613 (77.8%)	737 (77.3%)		
4	INTPRL (-)	158 (44.3%)	277 (34.9%)	421 (44.4%)	18.13*** N = 2,096 df = 2	1.77
	INTPRL (+)/ IMPRL (+/-)/ OTHR	199 (55.7%)	515 (65.1%)	526 (55.6%)		
5	IMPRL (+)	105 (29.4%)	295 (37.2%)	296 (31.3%)	9.77** N = 2,096 df = 2	0.10
	IMPRL (-)/ INTPRL (+/-)/ OTHR	252 (70.6%)	497 (62.8%)	651 (68.7%)		
6	IMPRL (-)	1 (0.3%)	28 (3.5%)	6 (0.6%)	27.18*** N = 2,096 df = 2	1.26
	IMPRL (+)/ INTPRL (+/-)/ OTHR	356 (99.7%)	764 (96.5%)	941 (99.6%)		
7 (H ₆) ^b	INTPRL (+/-)	244 (68.3%)	456 (57.6%)	631 (66.6%)	20.24*** N = 2,096 df = 2	0.45
	IMPRL (+/-) ^a	106 (29.7%)	323 (40.7%)	302 (31.9%)		
8 (H ₄)	INTPRL (+)	86 (35.3%)	179 (39.3%)	210 (33.3%)	4.14 N = 1,331 df = 2	1.14
	INTPRL (-)	158 (64.7%)	277 (60.7%)	421 (66.7%)		

Table 6. *Continued*

Sub-Table	Category	Forum 1 (8 days)	Forum 9 (12 days)	Forum 14 (22 days)	χ^2 Homogeneity	χ^2 Trend ^a
9 (H ₅)	IMPRL (+)	105 (55%)	295 (62.3%)	296 (58.5%)	3.28 N = 1,171 df = 2	0.10
	INTPRL (+)	86 (45%)	179 (37.7%)	210 (41.5%)		
10	INTPRL (-)	158 (60.1%)	277 (48.4%)	421 (58.7%)	16.71*** N = 1,552 df = 2	0.76
	IMPRL (+)	105 (39.9%)	295 (51.6%)	296 (41.3%)		

^aAll trend Sub-Tables from 3 to 10 have a $df = 1$.

^bH₄, H₅, and H₆ refer to the hypotheses.

* $p < 0.025$; ** $p < 0.01$; *** $p < 0.005$.

For H₅, calculations in Sub-Table 9 indicate that there is no significant difference in the proportions of positive impersonal and positive interpersonal content, $\chi^2 (2, N = 1,171) = 3.28$. Both categories do not vary significantly over time. Relationships between proportions for both categories (22% for Forum 1, 64% for Forum 9, and 70% for Forum 14, for an overall difference of 46%) indicate a constant greater presence of positive impersonal content. The calculations indicate, however, that the initial differences in proportions do not vary significantly over time.

As for H₆, calculations in Sub-Table 7 indicate that overall interpersonal content (both positive and negative) differs significantly, $\chi^2 (4, N = 2,096) = 20.24$, $p < 0.005$, from overall impersonal content. This is a significant difference between-category variation, which indicates no homogeneity between distributions of categories, or a significantly greater presence of overall interpersonal content over impersonal content. This also indicates that categories are strongly associated.

Hypotheses H₇ and H₈ were accepted, based on the results presented in Table 7.

A first chi-square test for independence between forums over time was performed for frequency values in Sub-Table 1. Interpersonal content was found to be significantly related to the sum of reactive and interactive content for the set of forums, $\chi^2 (2, N = 441) = 14.79$, $p < 0.005$. Hypothesis H₇ was thus accepted.

A second chi-square test for independence between forums over time was performed for frequency values in Sub-Table 2. Although impersonal content was found to be significantly related to active content, $\chi^2 (2, N = 462) = 12.73$, $p < 0.005$, the chi-square test may not be considered valid as one of the cells has an observed raw frequency of 0. Thus, hypothesis H₈ could not be reasonably accepted.

Discussion of the Results

The literature makes no reference to the association of interpersonality and types of online interaction as such, although some authors hint at a relationship between

Table 7. Frequency of sentences for interpersonality and interaction categories and their analyses for forums tested

Sub-Table	Interaction		Interpersonality				χ^2
			INTPRL (+)	INTPRL (-)	IMPRL (+)	IMPRL (-)	
1 (H ₇) ^b	RCTV + INCTV	Forum 1	40	23			14.79*
		Forum 9	93	38			N = 441
		Forum 14	126	121			df = 2
2 (H ₈)	ACTV	Forum 1			77	0 ^a	12.73*
		Forum 9			184	15	N = 462
		Forum 14			183	3 ^a	df = 2

^aBecause one cell has an observed frequency of 0, the chi-square test is not valid.

^bH₇ and H₈ refer to the hypotheses.

* $p < 0.005$.

certain categories of interpersonality and interactivity (Schutz, 1994; Baym, 1995; Swales, 1990, in Herring, 1996). Rafaeli and Sudweeks (1998) offer the most extensive account of the relationship between these variables in mailing lists up to date. They found that among interactive messages, there is a tendency to express opinion (this is called “advocating” in this study) and to express agreement (twice as much as other messages). Also, interactive and reactive messages are more humorous and tend to contain fewer requests for information (this is called “impersonality” in this study). Overall, interactive messages exhibit a propensity to agreement and are more likely to contain self-disclosure, thus indicating that interactivity may be associated “with a sense of involvement and belonging” (p. 187).

This study supports all of the above in a longer time span for specific academic discussion forums. Reactive and interactive content were found to be more humorous, self-disclosive, supportive, praising, and inquiring than active messages (Sample Messages 1 and 2) which were found to be more fact oriented (Sample Message 3).

Sample Message 1:

Hello Paula and Ernesto (and everyone else, of course!):

You did a thorough and very interesting analysis of the Learning Space experience. Joining your comment with Carlos’ worry about students being in front of a computer for most of their courses, reminds me of what Romiszowski (1988, p. 62) suggests when selecting media for instruction.

He speaks of essential and optional media characteristics. The former refers to the clarity of the message depending on the nature of the subject matter, whereas the latter is concerned with media traits attractive to the learners as well as the learner’s study habits and the teacher’s teaching habits.

It seems to me that Learning Space's current state gets short from fulfilling Romiszowski's suggestion.

What do you think about this?

Regards!

Silvia

Sample Message 2:

Silvia:

I find your comments very interesting. The whole experience, as you describe it, sounds very familiar, especially the part where you mention which was the criteria for selecting technology (just being ironic).

I am using the Learning Space platform in both courses I am teaching this semester, so I have a little experience (good and bad, but more of the last one) in the subject. From what you mention in the UR2000 model, I suspect that constructivist (Bates) elements are very present. The question (I think I know the answer) is, how do you relate it to the using of Learning Space? Is it the very common way of doing things in this country (first use it and then justify it)? ? ?

Greetings ...

Carlos

Sample Message 3:

In many institutions, the media and technology selection are limited; the end-users aren't included in the development and implementation of the technology plans. I found that, in fact:

"The choice of media is a complex decision, influenced by a variety of factors, and therefore no quick and easy all-embracing rule is likely to be developed" (Romiszowski, p. 60).

Just because technology is placed in the classroom it does not mean that the teacher knows how to use it effectively. The teachers need adequate time and support to get fully up-to-date with the new technology:

"If you do happen to have a particular aversion to or phobia of a certain medium of instruction, then you are unlikely to use it well." (Romiszowski, p. 58).

This study confirms earlier findings regarding the relationship between reactivity/interactivity and socio-emotional content (Rafaeli & Sudweeks, 1998). However, there is a difference between this study and Rafaeli and Sudweeks': they state that interactivity is, perhaps, the cause of social dynamics of group communication. They also state that interactivity can lead to sociability. However, although this study was not intended to seek causation, it tends to reverse the equation: it seems that increased sociability can lead to increased reactivity and interactivity in academic online forums. Reactivity/interactivity are related to sociability and,

therefore, stimulating the latter may have important effects in augmenting the levels of the former.

This study lends support to Garrison and Anderson's (2003) claim that social presence is needed for cognitive presence in online environments and it also confirms the results of numerous studies that have shown that CMC is not inherently unsuitable for the cultivation of interpersonality (Kanuka & Anderson, 1998; Stacey, 1999, 2002; Swan, 2003; Gabriel, 2004; Lobry de Bruyn, 2004; Murphy & Coleman, 2004). The results suggest that interactivity, commonly attributed in the literature to technology, is brought about by inner process variables, such as the interpersonal content of messages, thus supporting the notion that online interactive participation and collaboration through computer conferencing can largely be determined by the type and degree of students' socio-affective content in postings. Despite its limitations, this study revealed social issues about learners' communicative processes that may have a direct impact on their educational outcomes. It helps to dispel the notion that academic CMC is (and must be) fundamentally and solely impersonal, and helps provide a better understanding of group dynamics and development in online conferencing.

Limitations

Dimensions of interpersonality were adopted and adapted from diverse sources to design a coding instrument that will have to be tested in similar and alternate settings. Some dimensions of this variable may have been left out, as most of the criteria for interpersonal analysis are derived from face-to-face interactions. The coding categories may well have to be validated in other studies, and probably modified and adjusted so as to suit other CMC environments, while adjustments need to be made on categories deemed as "borderline/fair" and "unacceptable/poor" according to kappa results, especially on the distinction between HMR and SRSM for the interpersonality variable, and on IMRTV for the interactivity variable.

Even though this case may be representative of online academic exchange (and therefore of courses which incorporate computer conferencing), its context specificity means that the conclusions must be considered tentative and valid only in this specific context.

Implications for Practice

Given the limitations of this study we cannot generalize from these results but we can cautiously suggest that they may be transferable to similar contexts. The connection between interpersonality and interactivity that is supported by this study suggests that online instructors should pay much closer attention to the development of the socio-emotional climate in their online classrooms. A considerable body of literature has developed in recent years that addresses the issues associated with virtual communities, their characteristics, and how to foster and maintain them

(Stacey, 1999, 2002; Brown, 2001; Curtis & Lawson, 2001; Conrad, 2002; Kanuka, 2002; Schwier & Balba, 2002; Browne, 2003). This study suggests that one key to a successful virtual community may lie in ensuring that its members make meaningful interpersonal connections before they are asked to engage in cognitive tasks. This has implications for the design of online courses that could involve building in additional time to foster such interpersonal connections. Further study is needed to identify some of the specific implications for instructional design and teaching online.

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Appendix: Description of categories

Table A1. Interpersonality (INPRSN)

Category	Category/code or label	Criteria/description
1	SPRT (support/alignment)	A non-critical, passive acceptance of points of view; agreement; approval; concession; compliance; friendly greetings (“hello”)
2	DSRE (disclosure)	Self-presentation (“I am ...”); revelation of novel, ordinary, or personal information other than views about the subject of discussion (interests, background, positive or negative feelings about the self). (“I feel ...”)
3	APRL (appraisal)	Admiration; commendation; praise; satisfaction with others’ ideas; positive astonishment; motivation; celebration; positive reinforcement of others’ contributions or others’ selves
4	HMR (humor)	Punch or end lines; explicit joking statements; display of wit; positive irony; tension relieving comments (other than self-disclosure or sarcasm); use of puns and humorous language
5	INQR (inquiry)	Asking expansive questions; asking for others’ opinions about an issue; appeal to or invite other participants to engage further in the discussion; interviewing others; requesting elaboration
6	INFM (inform/offer)	Forwarding factual information, either spontaneously offered or as an answer to a question or request
7	OPPTN (opposition/adversariality)	A direct opposition, intellectual conflict, or disagreement; a critical view, judgment, or assessment
8	RSVE (reserve)	An appeal to end the discussion or no attempt to pursue it further; explicitly cutting-off or inhibiting the interaction or the development of an idea
9	CHMT (chastisement)	Anger, open hostility; personal attacks; insults; swearing; disliking; hostile adversariality; unfriendly and destructive comments; rudeness; provocation
10	SRSM (sarcasm)	Does the sentence contain or show: Derision; making fun of somebody (or oneself) <i>ad hominem</i> or someone’s ideas; cruel forms of humor; hostile wit An “I am having a good time at your expense” overtone
11	ADVC (advocacy)	Forwarding opinions; self-centered use of personal pronouns (I, me, my, mine), such as “I think,” “I guess,” “It seems to me,” “My opinion is ...,” “I feel that ...” Self-promotion; strong and forcefully worded assertions; expressing views

Table A1. *Continued*

Category	Category/code or label	Criteria/description
12	RQST (ask/request)	Asking for factual information (other than opinion); questions seeking or eliciting orientation or information (requesting opinions and explanations is coded as inquiry); requesting repetition, clarification, or confirmation; requesting data or asking for examples
13	OTHR (other)	When the sentence does not contain any of the above-specified describing issues Use of rhetorical questions and questions to self (active inquiry); questions to which you do not expect an answer; questions not for others to express themselves; “tag” and “yes–no” questions. Questions that begin with “I wonder ...”

Table A2. Interaction (INACTN)

Category	Category/code or label	Criteria/description
A	ACTV (active)	Independence from other sentences; no reference, direct or indirect, to previous messages; not an answer to any previous idea; introduction of a new topic
B	EXRTV (explicit reactive)	Explicit reference to another sentence (even one’s own within the same message), message, person, or group
C	IMRTV (implicit reactive)	Implicit reference to another sentence (even one’s own within the same message), message, person, or group
D	EGINTV (engaging interactive)	Obvious attempts at reaching out and engaging others in conversation, such as asking questions, asking for comments, suggestions, or help; directly or indirectly inviting others to participate
E	INCTV (true interactive)	Any reference, directly or indirectly, to the manner in which a previous sentence(s) related to those preceding it (them) (i.e., is there any reference to how or whether earlier sentences were humorous, supportive, argumentative, chastising, stupid, informative, etc.)